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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,952	08/04/2003	Kevin J. Linthicum	013921-000025	5174

7590 06/16/2005

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EXAMINER

MULPURI, SAVITRI

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 06/16/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/633,952	LINTHICUM ET AL.	
	Examiner	Art Unit	
	Savitri Mulpuri	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
 - If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
 - If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
 - Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 68-80,82-85 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 68-80,82-85 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This action is in response to the applicant's communication amending the claims and providing terminal disclaimer, filed on 3/17/2005, cancellation of claim 81 and adding claims 85.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 68-84 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang et al (US 6,500,257) in combination with Nishio et al (US 5,786,606 A).

Wang et al teaches a method of forming gallium nitride semiconductor by forming AlN buffer layer "70" on SiC or Si "52"; laterally and vertically growing gallium nitride layer on the AlN layer with or without mask "56" to reduce dislocation density less than $10^7/\text{cm}^2$ (see 6A -6 E; col. 1, lines 39-44; col.4, lines 50-58; col.5, lines 40-52; col. 6, lines 14-27; col.7, lines 55-58

Wang et al do not teach (1) converting silicon substrate to silicon-based compound, which is, for example, silicon to silicon carbide, (2) SOI or SIMOX substrates, (3) thickness of the gallium nitride layer.

Nishio et al teaches a method of forming a gallium nitride semiconductor structure comprising: forming a silicon layer on a silicon substrate; converting a surface of a silicon substrate to form a silicon-based compound, which is silicon carbide (see col.4,

Art Unit: 2812

lines 59-61; col. 6, lines 45-50; col.10, lines 64-68, col.21, lines 60-67); forming AlN buffer layer directly on SiC layer as same as instant claim 74 (see col.13, lines 9-14); forming GaN layer extending continuously and directly on the AlGaN or AlN buffer layer and forming light emitting device in the GaN (see Fig. 11A and related description). Nishio et al also teaches bulk silicon substrate, or SOI substrate or SIMOX substrate as similar to instant claims 75-77(see col. 4, lines 24-47). Nishio et al teaches defect density less than $10^9 / \text{cm}^3$ (see col.6, lines 45-50; col.7, lines 10-12); Nishio et al teaches laminate structure (stack) of GaN layers 63-68 is 2.7 microns (see col. 11, lines 33-38), which means individual GaN layers are less than 2 microns supporting the instant claim 79. It would have been obvious to one of ordinary skill in the art to modify the invention of Wang by providing silicon substrate such as SOI or SIMOX and then converting silicon to silicon carbide followed by successive growth of AlN and GaN layer with thickness in the range of 0.5 to 2 microns for device fabrication because such process eliminates the residual strain in the gallium nitride layer (see col.1, lines 51-47; col.2, lines 1-17).). In the modified invention of Wang would inherently have AlN buffer layer having greater thickness than converted layer of silicon carbide.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Davis et al (US 6,570,192) teaches growing GaN "108a, 108b "laterally and vertically on silicon oxide mask"106" not on AlN layer as specified in the instant claims.

Response to Amendment

Applicant argues that that Wang teaches lateral growth of GaN from the GaN material sidewall to form a region having reduced defects. However, Wang teaches both lateral and vertical growth to form GaN layer. Applicant argues that Nishio teaches vertical growth of GaN on SiC layer and the purpose of GaN layer on SiC is to reduce the strain and defect density of the vertically grown GaN based layer. However, Wang teaches both lateral and vertical growth to form GaN layer.

Nishio specifically is relied on the teaching of converting Si to SiC layer and using SIMOX or SOI substrate and the thickness of GaN layer. In other words Nishio is relied on the base of SiC and SIMOX or SOI to grow GaN layer but not on the how the GaN is grown. So it is immaterial whether the GaN is grown laterally or vertically in the invention of Nishio because Nishio is relied on how the base or template is formed to grow GaN layer.

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of


Art Unit: 2812

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-Fri from 7 a.m. to 4 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Savitri Mulpuri
Primary Examiner
Art Unit 2812